WORKPLAN
Dayton Canyon Site
West Hills, CA

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<u>TABLES</u>

FIGURES

APPENDICES

1.0 INTRODUCTION

1.1 SUMMARY OF CURRENT CONDITIONS

The Centex Homes “Sterling Residential Neighborhood” site is located in West Hills, California, just west of the intersection of Roscoe Blvd. and Valley Circle Blvd as shown in Figure 1. The Sterling Residential Neighborhood property is in an undeveloped area which has no history of perchlorate usage, storage, or releases. As part of Centex Homes environmental due diligence at this site, perchlorate was found in some locations of Dayton Canyon Creek. Based on these observations, Centex Homes has entered into a voluntary clean up agreement with the Department of Toxic Substances Control (Glendale Branch) to perform a Preliminary Endangerment Assessment of the proposed future development areas, perform characterization studies of the creek and complete a removal action to address the perchlorate contamination in the creek area. As requested by DTSC, Centex Homes is submitting this workplan to address these issues.

1.2 OBJECTIVES OF WORKPLAN

The overall objective of this workplan is to further investigate the surface and subsurface soil conditions at the Sterling homes site for the presence of perchlorate. The data collected will be used to determine the potential risks at the future development locations, and will be used to characterize Dayton Creek to support the future removal action. The specific objectives of this workplan are as follows:

- Delineating the lateral and vertical extent of perchlorate detected in the Dayton Canyon creek bed.
- Evaluate whether contamination has migrated down Dayton Canyon from the Rocketdyne Facility.
- Evaluate whether the Dayton Canyon site adjacent to the creek have been been affected by contaminants.

This workplan provides the procedures to investigate the Centex Dayton Canyon site and contains the following information:

- Site background
- Rationale for sampling including site locations and methods of analysis
- Sampling methods
- Sampling procedures
- Containers and sample preservation
- Sample handling, packaging and shipping
- Documentation requirements

- Decontamination procedures
- Quality Control procedures and plans

2.0 BACKGROUND

2.1 SITE HISTORY

2.1.1 DAYTON CANYON SITE HISTORY

The Centex Homes “Sterling Residential Neighborhood” site is located in West Hills, California, just west of the intersection of Roscoe Blvd. and Valley Circle Blvd in an area known as Dayton Canyon. The Sterling Residential Neighborhood property is in an undeveloped area, which has no history of perchlorate usage, storage or releases. The western boundary of the proposed Sterling Homes site is located approximately 0.5 miles directly east of the approximate eastern boundary of the Rocketdyne facility test site, also known as the Santa Susana Field Laboratory (SSFL) in Ventura County, California. The site vicinity is shown in Figure 2.

2.1.2 ROCKETDYNE SITE HISTORY

The Rocketdyne facility is located in the Santa Susana Region of Ventura County, California. Operational activities at the SSFL began in 1948 and have primarily included research, development, and testing of liquid-propellant rocket engines and associated components (pumps, valves, etc.). Liquid-propellant rocket engine testing activities have been conducted at six major rocket engine test areas. These areas were in operation simultaneously in the late 1950s and early 1960s. In addition to the primary facility operation for testing liquid-propelled rocket engines, the SSFL was used for nuclear energy research and development and testing of water jet pumps and lasers.

Petroleum fuel hydrocarbons and chlorinated solvents have been used at the SSFL in large volumes. Petroleum hydrocarbons were used as fuel for many of the liquid-propellant rocket engine tests performed there. Chlorinated solvents, primarily TCE, were used following engine tests to clean elements of the rocket engines and for other equipment degreasing operations at the SSFL. Solid propellants, including perchlorate compounds, were used at the SSFL for research and testing operations. Perchlorate was used in relatively small quantities as an oxidizer for the production of turbine spinners and igniters; for research, development, and production of flares; and for small-scale solid-propellant rocket motors research, development, and testing.

The Rocketdyne facility was used, as indicated above by the Department of Energy for nuclear testing in its Area IV facilities contained in the western most portions of the site, approximately 3.5 miles from the Sterling Site. The Agency for Toxic Substances and Disease Registry (ATSDR) has previously investigated the offsite areas east and down gradient (Bell Canyon) from Area IV. No significant levels of radionuclides were found in these areas. Due to the topography between Area IV and the Sterling site, and lack of detection of nuclear related hazards in Area 1 of the Rocketdyne Facility, limited nuclear related hazards were tested for as part of this investigation.

Residual perchlorate concentrations from rocket testing at the Rocketdyne facility have been identified in the area of the former laboratory and test range in the eastern region, referred to as Area I, which is more than a mile from the Sterling site. The Rocketdyne facility has been the subject of various environmental investigations and remediation activities. (USEPA Resource Conservation and Recovery Act (RCRA) Facility Investigation Program Report, MWH, July 2004). Based on the results of the Rocketdyne Investigations, the Field Laboratory which used perchlorates, is up-gradient from the Dayton Canyon site, and drains through the Happy Valley area, as shown in Figure 2, and into Dayton Canyon Creek. The surface water flow through Happy Valley has been monitored as part of Rocketdynes NPDES permit requirements. Table 1 provides a summary of the NPDES monitoring data for HV-1, HV-2 and the outfall at Roscoe Blvd and Valley Circle. The levels of perchlorate in the surface water have been below detection limits since February 2004.

2.2 CONTAMINANTS OF CONCERN

Based on the information available on the Rocketdyne Site and discussions with the DTSC and the Regional Water Quality Control Board, the following contaminants of concern have been identified and will be addressed as part of the PEA Investigation and Creek Characterization. The primary contaminant of concern, which has been detected in the area of the creek is perchlorate. Other contaminants of concern which have been used at the Rocketdyne site include, CAM Metals, volatile organic compounds, petroleum hydrocarbons, hydrazine, dioxins, and radionuclides.

2.2.1 PERCHLORATE

Ammonium perchlorate, which is generally referred to as “perchlorate”, is used as a strong oxidizing agent to combust fuels such as petroleum hydrocarbons or hydrazine in rockets. Perchlorate is an anionic salt composed of one molecule of chlorine and four molecules of oxygen and is expressed as $^{-}ClO_4$. The perchlorate salts include ammonium, potassium, sodium and calcium. Perchlorates are currently used in the Space Shuttle Launch System, missiles, pyrotechnics, flares, and in automobile airbags. Perchlorates have also been shown to be present in Chilean Nitrate fertilizers at relatively high levels.

The California Department of Toxic Substances Control (DTSC) has established an advisory level of 6 ppb, or “parts per billion” as the acceptable level of perchlorate in public drinking water sources. The groundwater at the Sterling property is not intended to be used for drinking water and the proposed development will utilize city water as the source of drinking water.

Studies of perchlorate in drinking water sources have shown its primary toxic effect is on the thyroid gland in children and thyroid compromised adults. Studies by ATSDR and the USEPA have shown that exposure to perchlorate by inhalation or contact with skin does not present a significant risk. The primary route of concern is drinking water which can present a long-term daily exposure risk. Recent studies have shown that some food crops such as lettuce can have levels of perchlorate when grown using water containing perchlorate.

The above potential toxic effects have been demonstrated in various animal studies and epidemiological studies. DTSC established a 6 ppb drinking water advisory standard for perchlorate, EPA's recently released Reference Dose (RfD) for perchlorate is equivalent to an exposure limit of 24 ppb. DTSC's public health goal and EPA's RfD are defined as levels of perchlorate which are known to be safe to ingest.

2.2.2 VOLATILE ORGANIC COMPOUNDS

Volatile organic compounds such as trichloroethylene, 1,1-dichloroethylene, and 1,2-dichloroethylene were used at the former Rocketdyne site for cleaning and degreasing of missile and rocket components. Petroleum hydrocarbons were also used at the former Rocketdyne site as fuel components. The petroleum hydrocarbons may have contained volatile hydrocarbons such as benzene, toluene, ethylbenzene, and xylenes.

2.2.3 METALS

Metals such as beryllium, chromium, nickel, lead, zinc, and others were used at the former Rocketdyne site.

2.2.4 PETROLEUM HYDROCARBONS

Limited quantities of petroleum hydrocarbons may have been illegally dumped at the Dayton Canyon site with debris, auto parts and other materials.

2.2.5 HYDRAZINE

Hydrazine is a chemical which has been used as a fuel component in some types of rockets and missiles. Due to the Dayton Canyon site's proximity to the former Rocketdyne site, hydrazine, a component of rocket fuel will be considered a potential contaminant of concern.

2.2.6 DIOXINS

The term dioxin is commonly used to refer to a family of toxic chemicals that all share a similar chemical structure and common mechanism of toxic action. This family includes seven of the polychlorinated dibenzo dioxins (PCDD's), ten of the polychlorinated dibenzo furans (PCDF's) and twelve of the polychlorinated biphenyls (PCB's). PCDD's and PCDF's are produced at trace levels by incomplete combustion of organic materials. These materials have also been shown to be produced by brush fires. Based on concerns expressed at other sites adjacent to the rocketdyne site, dioxins will be considered a potential contaminant of concern.

2.2.7 RADIOLOGICAL MATERIALS

As indicated above, no radioactive materials were used or stored at the Dayton Canyon site. The Rocketdyne facility used various radioactive materials on the western portion of the former site. The primary radionuclides of concern are Strontium-90 and Cesium-137. These materials are alpha, beta and gamma emitters.

2.3 SITE CHARACTERISTICS

2.3.1 SITE CHARACTERISTICS

The Sterling site ranges in elevation from approximately 900 to 1300 feet amsl. The area is approximately 28 miles northwest of downtown Los Angeles, California, and is located in Los Angeles County. The site is adjacent to Dayton Creek which drains from the Happy Valley area flowing eastward through the proposed development site.

The Sterling site is located east of a dormant portion of the Rocketdyne facility, on the east side of a hill south of the Happy Valley Drainage Area as shown in Figure 2. Previous studies of this area and local groundwater resources have not shown significant levels of perchlorate or trichloroethylene, another commonly used chemical at the Rocketdyne site. Runoff in Dayton Canyon has been sampled by DTSC and the State Water Resources Control Board (SWRCB). The routine monitoring of surface run-off from these areas tested at SWRCB outfalls HV-1, HV-2, and the outfall at Roscoe and Valley Circle during storm events have not detected significant levels of perchlorate as recent as February, 2004. Table 1 provides a summary of the NPDES monitoring for perchlorate. As shown in Table 1, the levels of perchlorate in the surface water samples have been below detection limits since February 2004.

2.3.2 LOCAL GEOLOGY AND GROUNDWATER

The subject site consists of approximately 375 acres and approximately 100 acres will be developed and the remainder transferred to the Santa Monica Mountains Conservatory. The site is located at the western terminus of Roscoe Boulevard near the intersection of Valley Circle, and approximately 0.5 miles west of the Chatsworth Reservoir. Topographically, the irregular shaped parcel is located within the eastern portion of the Simi Hills and is generally characterized by two major southeast drainages, the southern most being named Dayton Canyon. The central portion of the site is characterized by northwest-southwest trending ridge lines ascending from the drainage courses. The northwest-southeast portion of the property consists of steep slopes ascending to the northwest then flattening near the top of the ridge. Existing slope gradients range from nearly level on the ridge to and at the mouth of the Dayton Canyon to an average of 2(h):1(v) with locally steeper slopes. Drainage of the property is generally to the southeast via Dayton Canyon and the unnamed drainage to the north of Dayton Canyon. Total relief of the parcel is on the order of 800 feet.

Quaternary alluvial sediments and bedrock underlie the site and are locally mantled by nonengineered fill and debris flow material. Leighton and Associates, Inc. (LAI) performed a limited geologic reconnaissance in 1989 and 1991.

LAI reported that the bedrock at the site consists of interbedded sandstone and siltstone assigned to the Cretacious-age Chatsworth Formation. The Chatsworth Formation is exposed throughout the hillside area and in the deeper incised canyon bottoms.

Quaternary – age alluvial deposits are present, mantling the bedrock within the lower lying eastern portion of the site and adjacent to Valley Circle. The alluvial deposits generally consist of silty sands with pebbles to cobbles in moderately dense and moist conditions.

Non-engineered fill exists on the property along the south side of the access road in Dayton Canyon; in areas associated with building pads that supported small residences, mobile homes, stables, and barns. These fill soils generally consist of brown to light brown silty fine to coarse sand and dark brown sandy clay in a medium dense to hard and damp condition.

According to the County of Los Angeles Public Works Hydraulic/Water Conservation Division (LACO), the eastern portion of the site is located within the San Fernando groundwater basin. Based on 1990 groundwater contour maps prepared by Los Angeles County, the depth to groundwater was estimated to be approximately 70 feet below ground surface. However this estimation was obtained during a prolonged drought and the groundwater level is assumed to have risen.

2.4 PRELIMINARY INVESTIGATION RESULTS

2.4.1 INITIAL STUDIES

The results of the Preliminary Site Investigation are summarized in this section. A copy of the results was published in the July 26, 2005 report included in Appendix A. Based on the location of the Sterling site relative to the Rocketdyne site, it was determined as part of the Preliminary Site Investigation to sample a portion of the Dayton Canyon Creek drainage running through the Sterling site for perchlorate and volatile organics such as trichloroethylene and 1,1- dichloroethylene. The creek appeared to be the most likely potential pathway for perchlorate to have theoretically migrated offsite from the Rocketdyne facility to the location of the proposed development although there have been no prior test results to suggest such a migration had occurred. For evaluation purposes, the creek was divided into areas to facilitate the investigation as shown in Figure 3.

Initial samples were collected at the site on May 25, 2005. During these initial studies, four sediment samples (samples 1A-4) and one duplicate sample (sample 1B) were collected in jars and transported under chain of custody to MWH Laboratories for analysis of perchlorate and volatile organics. The results of this sampling indicated levels of perchlorate as shown in Table 2, which ranged from 320 to 62,000 mg/kg (ppm). The sample collection locations are shown in Figure 3. Samples exceeding EPA's PRG of 7.8 mg/kg (ppm) are identified in red.

2.4.2 SURFACE SOILS

On Friday, May 27, 2005, three surface soil samples were collected as shown in Figure 3. Two of the samples were collected in the areas indicated for future grading operations (samples SS-01 and SS-02). One surface sample (sample SS-03) was collected from soils adjacent to area 4 as indicated in Figure 3. Samples exceeding the PRG for perchlorate are identified in red. The results of the analysis indicated perchlorate levels below the detection limits in samples from the two future grading areas (samples SS-01 and SS-02). Sample SS-03 showed levels of perchlorate at 1,200 mg/kg (ppm) in the soil collected adjacent to the creek. The results of the sampling are presented in Table 1.

On June 14, 2005, four additional surface soil samples were collected approximately twenty feet south of the Creek in areas 1 through 4. The analytical results of the surface soils collected on June 14, 2005, outside but adjacent to the creek (SS-04 to SS-07) showed perchlorate levels below detection limits, as presented in Table 2.

On July 11, 2005, six additional surface soil samples were collected from the proposed developed area. The analytical results of the additional surface soils collected on July 11, 2005 in the proposed grading areas (SS-8 through SS-13) showed perchlorate levels below detection limits, as presented in Table 2. Total metal levels were found to be below regulatory limits, and generally within accepted background ranges, as shown in Table 3.

2.4.3 SEDIMENTS AND SOILS

On June 2 and 3, 2005, samples of sediments and soils were collected from various locations in the Dayton Canyon creek drainage, as shown in Figure 4. In these areas, unconsolidated sediments were sampled followed by the collection of undisturbed soil samples at depths of 1, 2, and up to 3 feet below ground surface using an auger or drive sampler. The samples collected were split into duplicate samples and transported under chain of custody to MWH Laboratories and Associated Laboratories for perchlorate analysis using USEPA Method 314.0.

The analytical results of the samples are presented in Table 2. The results of these analyses showed lower perchlorate levels relative to the initial analytical results. Samples collected in the area of the initial sampling showed perchlorate levels in the sediments as shown in Figure 4. Perchlorate levels were also observed in some of the 1 and 2 foot samples in the initial sampling area, as shown in Figure 4. Samples collected in the creek further west in areas 7 and 8 closer to the upstream tributaries from the Rocketdyne site, were below detection levels for perchlorate, as shown in Table 2 and Figure 4.

On June 18 and 20, 2005 sediments and soils were collected in the western areas 9 and 10 of the Dayton Canyon creek drainage. Three samples were also collected in areas 1, 2, 3 and 4 from underneath rocks and in one case a fallen tree trunk. No detectable levels of perchlorate were found in the upper western creek samples or from the samples collected from under the rocks and log. These additional samples were collected from the north side of the creek as shown in figures. The analytical results of the soil sampling (samples 4-14, 4-15 and 4-16) conducted on the east side of the creek on July 11, 2005, showed no detectable levels of perchlorate as shown in Table 2. Total metal levels were found to be below regulatory limits, and generally within accepted background ranges, as shown in Table 3.

2.4.4 PLANT AND PLANT DEBRIS

On June 18 and 20, 2005, plant leaves were collected from Dayton Canyon Creek. The leaves were collected from plants with new growth from along side the creek, as shown in Figure 5. The leaves were analyzed for perchlorate using USEPA method 314.0. The results of these analyses showed high levels of perchlorate on the surface of the leaves in Areas 1, 2, 3, and 4. The levels of perchlorate on the leaves in this area were relatively consistent, ranging from 32 to 42 mg/kg (ppm) as shown in Table 2. Samples collected from areas 5 -10, showed significantly lower perchlorate levels.

On June 18 and 20, 2005, plant debris was collected from the creek area. The debris was collected from the same area as the plant leaves described above, as shown in Figure 5. The debris was analyzed for perchlorate using USEPA Method 314. The results of these analyses showed high levels of perchlorate on the surface of the debris in Areas 1, 2, 3, and 4. The levels of perchlorate on the debris in this area were relatively consistent, ranging from 42 to 57 mg/kg (ppm) as shown in Table 2. Samples collected from area 5, 6, 7, and 10 showed significantly lower perchlorate level. Samples were not collected in areas 7 and 8 since the area was sparsely vegetated and was primarily rocks with very little plant debris and was heavily infested with ants.

2.4.5 WATER SAMPLING

Water samples were collected on July 19, 2005 from the creek in area 4, and from a seep on the eastern side of area 8. The results of analysis of these samples indicated the perchlorate levels were below the detection limit of 4 ppb in water. The location of the water sample and the seep sample is shown in Figure 4.

2.4.6 PERCHLORATE CONFIRMATION TESTING

As previously discussed in the July 26, 2005 report, USEPA Method 314.0 for the analysis of perchlorate may produce false positive results in some cases. A series of retained samples and samples collected from areas previously investigated, as shown in Table 2, were submitted to STL Laboratories in Sacramento for analysis using both USEPA Method 314.0 and 8321 M. The results of this testing confirmed the presence and concentrations of perchlorate. These results are presented in Table 2.

2.4.7 RADIOLOGICAL SURVEY RESULTS

As shown in Table 3, no significant residual radioactivity was detected in the areas monitored. The areas monitored for radioactivity are shown in Figure 6. All of the results were below the instrument's detection limit of 10 microrems per hour.

2.5 SUMMARY OF FINDINGS

The results of the initial sampling described above indicate perchlorate levels which are not consistent with the physical setting and the run off conditions or prior sampling data from the Rocketdyne site. Further, the presence of perchlorate in the creek sediments is also unlikely, due to the high volume of flow through the creek this year from heavy rains. Given these run-off conditions and rainfall amounts from this past season, perchlorate present in the creek sediments would be quickly dissolved or washed away. In addition, the results of the sediment and soil samples collected upstream toward Rocketdyne were below detection limits for perchlorate, as shown in Table 2. Perchlorate was not detected in most of the deeper samples, indicating that the perchlorate had not had sufficient time to dissolve and infiltrate downward, or that there is an insufficient mass of perchlorate in the surface soils to contaminate the soil column.

Analysis of recent fresh plant leaves and debris from the creek area showed extremely high levels of perchlorate on the surfaces of the leaves. The presence of high levels of perchlorate on the surface of the leaves in the lower creek area cannot be explained by any normal transport mechanism. The results of the plant leaves and debris analysis shown in Figure 5 indicate relatively uniform levels of perchlorate along areas 1, 2, 3 and 4. Analysis of two of the plant and plant debris samples show levels of strontium on the leaf surfaces. Further the results of samples 3-11, 3-12 and 3-13 in areas 1, 2, 3, and 4 which were collected from underneath rocks or a log, showed no detectable levels of perchlorate. If the perchlorate was transported down stream, then the water and soils under these materials would have been expected to contain levels of perchlorate, consistent with levels detected in surrounding soil sediments.

As shown in Table 2, the variation in split samples is significant. The large variation demonstrates that the perchlorate is not uniformly distributed in the soil, but appears to occur in a point source type manner. The areas where perchlorate was detected are isolated by larger areas where no perchlorate was detected.

As shown in Figure 2, the Sterling site is a substantial distance from the Rocketdyne site and is located in a remote drainage area. The source of the perchlorate or mechanism of its release has not been identified. Samples collected from the proposed development areas and east of the creek showed levels of perchlorate below detection limits and levels of metal below regulatory limits. These results indicate that the perchlorate identified in the creek was not transported via these areas by runoff or surface soil movement. The results of the water and seep analyses also indicate that runoff from the upper creek is not a source of perchlorate. Therefore, based on the current data, it is clear that the perchlorate levels recently detected in the creek are not from transport by flow through the creek from Rocketdyne or from airborne particulate transfer from their property. Based on the data collected, it appears that the perchlorate in the creek is from an exogenous and unidentified source.

3.0 SCOPE OF WORK-DAYTON CREEK REMOVAL ACTION CHARACTERIZATION

3.1 INTRODUCTION

Since the Centex Dayton Canyon site is very large, approximately 100 acres, the work plan has been divided up into four sub-areas, based on the topography of the site. The sub-areas shown in Figure 7 are as follows:

- Dayton Canyon Creek - this area located in the center of Figure 7.
- Dayton Canyon North - this area is north of the creek adjacent to Valley Circle.
- Dayton Canyon South - this area is south of the creek.
- Dayton Canyon West - this area is west of the Dayton Canyon North and South area. The area is divided from the south area by a ridge line as shown in Figure 7.

The specific objectives for the Dayton Creek Removal Action Characterization workplan are as follows:

- Delineating the lateral and vertical extent of perchlorate detected in the Dayton Canyon creek bed.
- Evaluate whether contamination has migrated down Dayton Canyon from the Rocketdyne Facility.

3.2 DAYTON CANYON CREEK

Due to the nature of the creek structure, a biased sampling plan was developed to provide a more detailed delineation of the perchlorate in the creek bed and banks. Based on the structure of the creek we propose to collect one bank soil sample and one creek sediment sample approximately every 200' from Valley Circle to end of the lower creek area shown in Figure 8. This will provide approximately 55 soil locations. The eastern drainage area, as shown in Figure 8 will also be sampled, at a rate of one sediment sample and one bank sample approximately every 200 feet from the creek to the property boundary. Near the western end of the lower creek, one sediment sample and one bank sample will be collected from the western drainage area shown in Figure 8. If the results of the analysis of these samples indicate the presence of perchlorate, additional samples will be collected in the drainage areas to delineate the extent of the contamination.

As shown in Figure 8 areas where the preliminary sampling showed levels of perchlorate, will be investigated further. As shown in Figure 8 there are seven focused investigation areas. These areas will be sampled, as shown in Figure 8 at a rate of approximately one sample for every 1000 square feet, to further delineate the perchlorate concentrations. Soil samples will be collected at depths of 0', 3' and 5' bgs in most areas of the creek. The samples will be analyzed for perchlorate using US EPA Method 314.0. Selected samples will be collected using US EPA Method 5035 and will be analyzed for Volatile Organic Compounds using USEPA Method 8260b, as shown in Table 4.

In the area of the upper creek, as shown in Figure 9, we propose to collect one bank soil sample and one creek sediment sample approximately every 500' from the last boring shown in Figure 8, to the just below NPDES Sampling Point HV-2 and the Rocketdyne boundary. This will provide approximately 16 soil locations.

The procedures for collecting and analyzing these samples are described in Section five (5).

If the results of the above sampling and analyses identify levels of perchlorate, additional sampling may be performed to further delineate the area. Prior to any additional sampling, the DTSC representatives will be contacted to approve of any changes to the current plan. Approved changes will be documented using a Technical Memorandum.

3.3 RADIOLOGICAL TESTING

As part of the Dayton Creek Characterization, a radiological survey will be completed to determine if any radiological materials are present in the creek sediments or bank soils. Each sampling locations shown in Figures 8 and 9 will be monitored for residual radioactivity. The radiological survey will be conducted using a Ludlum 2241 Survey Meter equipped for monitoring alpha, beta and gamma radiation. The survey will be performed by placing the probe on the ground surface for one minute. The maximum rem (roentgen equivalent man) rate (microrem per hour) will be recorded, and probe cleaned for the next area. A rem is a measure of the dose of any ionizing radiation to body tissue in terms of a biological effect. The global background radiation level is approximately 360 millirems per year or 41 microrems per hour.

Surface soil samples for radioactivity monitoring for Strontium-90 and Cesium-137 will be collected at approximately 5 percent of the locations monitored and at each location exceeding the background level by 50 percent or more. These samples will be submitted to the laboratory for analysis using USEPA Method 900 for radionuclides.

4.0 PRELIMINARY ENDANGERMENT ASSESSMENT INVESTIGATION

4.1 INTRODUCTION

As previously indicated, the Centex Dayton Canyon site is very large, approximately 100 acres, the work plan has been divided up into four sub-areas, based on the topography of the site as previously discussed in Section 3.0. The Preliminary Endangerment Assessment will be conducted in the North, South, and West Dayton Canyon Areas as shown in Figure 7.

The specific objective for the Preliminary Endangerment Assessment Investigation workplan is to evaluate whether the Dayton Canyon sites adjacent to the creek have been affected by contaminants. Further, the data developed will be used to evaluate the residual risks for residential development.

Although perchlorate has been identified as the primary contaminant of concern, due to the proximity of the Rocketdyne site, the following other contaminants which have been observed at the Rocketdyne site will also be sampled and analyzed for during this PEA Investigation. The other contaminants of concern include CAM Metals, volatile organic compounds, petroleum hydrocarbons, hydrazine, dioxins, and radionuclides.

4.2 Preliminary Endangerment Assessment-Scope of Work

4.2.1 DAYTON CANYON NORTH

The number of samples to be collected in the Dayton Canyon North area, were generated using the Department of Defense Visual Sampling Plan Software. The number of samples to be collected was determined using a one-tailed 90% confidence interval. The Visual Sampling Plan Software discussed is a computer program, developed by the Department of Defense and Department of Energy to produce technically defensible sampling plans for surface soils and surface waters. The program statistically determines the number of samples required to investigate a given area, based on the area dimensions, and the level of statistical confidence required for the data.

The Dayton Canyon North area will be divided into 100’ by 100’ grids (approximately 10,000 square feet). The grid lines will be staked and numbered for reference purposes as shown in Figure 10. Figure 10 also shows the proposed sample locations. A total of twelve areas will be sampled in the North Dayton Canyon area. Soil samples will be collected from the selected areas which are consistent with the proposed grading and re-compaction plans at depths of 0’, 3’, and 5’ bgs. Soil gas samples will be collected at depths of 15’ bgs. Table 5 provides a summary of the analyses to be conducted for each sampling point and depth. The specific area to be sampled within the grid will generally be the center, unless obstructed.

Specific procedures for sampling are provided in Section 5.

4.2.2 DAYTON CANYON SOUTH

The Dayton Canyon South area will be divided into 100' by 100' grids (approximately 10,000 square feet). The grid lines will be staked and numbered for reference purposes, as shown in Figure 11. Figure 11 also shows sample locations. The number of samples to be collected and the approximate area were generated using the Department of Defense Visual Sampling Plan Software, as discussed above. The number of samples to be collected was determined using a one-tailed 90% confidence interval as previously discussed in Section 4.2.1. The specific area to be sampled within the grid will generally be the center, unless obstructed. A total of 10 areas will be sampled in the South Dayton Canyon area. Soil samples will be collected from the selected areas which are consistent with the proposed grading and re-compaction plans at depths of 0', 3', and 5' bgs. Soil gas samples will be collected at a depth of 15' bgs. Table 6 provides a summary of the analyses to be conducted for each sampling point and depth.

4.2.3 DAYTON CANYON WEST

The Dayton Canyon West area will be divided into 100' by 100' grids (approximately 10,000 square feet). The grid lines will be staked and numbered for reference purposes, as shown in Figure 12. Figure 12 also shows sample locations. The number of samples to be collected and the approximate area were generated using the Department of Defense Visual Sampling Plan Software as previously discussed in Section 4.2.1. The number of samples to be collected was determined using a one-tailed 90% confidence interval. The specific area to be sampled within the grid will generally be the center, unless obstructed. A total of 25 areas will be sampled in the west Dayton Canyon area. Soil samples will be collected from the selected areas at depths of 0', 3', and 5' bgs. Soil gas samples will be collected at a depth of 15' bgs. Table 7 provides a summary of the analyses to be conducted for each sampling point and depth.

4.2.5 RADIOLOGICAL TESTING

As part of the PEA Investigation, a radiological survey will be completed to determine if any radiological materials are present in the future development areas. Each of the grid areas shown in Figures 10, 11, and 12 will be monitored for residual radioactivity. The radiological survey will be conducted using a Ludlum 2241 Survey Meter equipped for monitoring alpha, beta and gamma radiation. The survey will be performed by placing the probe on the ground surface for one minute. The maximum rem (roentgen equivalent man) rate (microrem per hour) will be recorded, and probe cleaned for the next area. A rem is a measure of the dose of any ionizing radiation to body tissue in terms of a biological effect. The global background radiation level is approximately 360 millirems per year or 41 microrems per hour.

Surface soil samples for radioactivity monitoring for Strontium-90 and Cesium-137 will be collected at approximately 5 percent of the locations monitored and at each location exceeding the background level by 50 percent or more. These samples will be submitted to the laboratory for analysis using USEPA Method 900 for radionuclides.

4.2.6 ADDITIONAL ANALYSES

If the results of the above sampling and analyses identify areas of contamination, additional sampling may be performed to further delineate the area. Prior to any additional sampling, the DTSC representatives will be contacted to approve of any changes to the current plan. Approved changes will be documented using a Technical Memorandum.

5.0 ANALYTICAL AND SAMPLING METHODOLOGY

5.1 ANALYTICAL PARAMETERS

As indicated in Tables 5, 6, 7, and 8, soil and sediment samples will be analyzed for a variety of analytes. The analyses to be conducted include the following:

- Perchlorate (USEPA Methods 314.0 and 8321M)
- Volatile organic compounds (USEPA Method 8260B)
- Soil Gas – Volatile Organics (USEPA Method 8260B)
- Total petroleum hydrocarbons (USEPA Method 8015M)
- CAM metals (USEPA Method 6010B/7471A)
- Hydrazine (ASTM D-1385-88)
- Dioxins (USEPA Method 1613b)
- Radiological Testing (USEPA Method 900)

Tables 5 through 8 indicate the analysis to be conducted for each sample collected. Quality control parameters and requirements are presented in the Quality Assurance Project Plan in Appendix B. Table 9 presents the detection limits of the relevant parameters for each of the analysis to be conducted.

5.2 SAMPLING METHODS

5.2.1 SEDIMENTS AND SOILS

Soil and sediment samples will be collected using a hydraulically pushed sampling system (Geoprobe) or a hand auger and drive sampler. The hydraulic sampling unit will be equipped with a 1.5” stainless steel barrel with a polyethylene sleeve. The Geoprobe unit is mounted on a truck or other unit. The sampling barrel is pushed to the designated depth and then retrieved. The soil samples will be collected by cutting the desired segment from the polyethylene tube. The tube will then be sealed with teflon and capped. The procedures for sampling using the hydraulically pushed system are provided in Appendix C.

In areas where the hydraulic unit cannot access the sampling location, the samples will be collected using a 2” hand auger unit or a 2” mechanical drill unit. The hand auger will be used to remove the soil to the desired depth. The soil sample will be collected using a split spoon sampler and a drive hammer. The samples will be collected in 1.5” brass tubes, sealed with teflon and capped.

Soil samples for Volatile organic compound analysis in the creek area will be collected using the USEPA Method 5035 protocol using an Encore Sampler or equivalent sampling device. The VOC samples will be obtained by sampling the base of the brass tubes immediately upon removal from the sampler.

Volatile Organic Compounds samples evaluated using soil gas sampling in the North, South and West Dayton Canyon areas. The soil gas samples will be collected using DTSC's Advisory of Active Soil Gas Investigations. A copy of the protocol is included in Appendix C. The soil gas probes will be hydraulically pushed into the ground to a depth of 5' and 15'. Soil gas samples will be collected and analyzed in the field using a mobile laboratory, or submitted to a certified laboratory for analysis. If a mobile laboratory is used, a least ten percent of the samples will be submitted to a certified laboratory for analysis for quality control purposes. On completion of the 5 foot soil gas sample, the probe will be advanced to 15 feet. If the probe encounters refusal, a soil gas sample will be collected, as long as the depth exceeds 10 feet.

All sampling locations will be staked and photographed. The sampling locations will be documented using a hand held Global Positioning Satellite receiver, and the coordinates recorded.

5.2.2 SURFACE WATER SAMPLES

If surface water samples are to be obtained, they will be collected as follows. For creek samples, a clean 100 ml beaker will be used to collect the water from the stream. The water will then be transferred to 40 ml VOA vials (unpreserved) and capped. The samples will be labeled and placed in a 0-4 C cooler. Seep samples are to be collected by driving a 1 inch diameter perforated pipe into the seep. The water sample for analysis is collected from the pipe effluent, after at least 5 pipe volumes of water has been collected.

5.3 SAMPLE PRESERVATIVE, CONTAINERIZATION AND HOLDING TIMES

Samples for chemical analyses will be containerized and preserved in accordance with procedures listed in Table 9. For each parameter, the required type of container, sample volume, sample temperature, type and concentration of preservative, and allowable holding times have been determined and are shown in Table 9. All samples will be placed in individual precleaned containers for shipment to the laboratory. The sample containers will be obtained from the laboratory designated to perform analyses. Sample containers will be inspected randomly for the presence of visible contaminants by the sampler before use. Sample containers with visible contamination or sample shipment containers with visible damage or contamination will be rejected. If there is any doubt as to whether or not a sample container has been thoroughly cleaned, the container will not be used.

Solid samples collected for chemical analyses will be packaged, labeled and placed in coolers with ice as soon as possible after collection. Solid samples submitted for physical properties analyses will not be cooled or preserved, but will be sealed in airtight plastic jars or bags for shipping to the laboratory. Sample holding times stated in Table 9 must be met unless otherwise specified in the analytical method. The samples will be shipped to the laboratory by overnight courier to minimize the time between collection and processing.

5.4 SAMPLE PACKAGING AND SHIPPING

The procedures listed below describe the proper packaging and shipment of samples to minimize the potential for sample breakage, leakage or cross contamination and to provide a clear record of sample custody from collection to analysis.

The field sampling coordinator shall be responsible for the enactment and completion of the Chain-of-Custody records and the packaging and shipping requirements outlined as follows and in project-specific sampling plans. Samples must be:

- Packaged so that they do not leak, break or vaporize. Waste samples should not be containerized with environmental samples to minimize chances of cross contamination.

- Properly identified and each shipment or transfer must be accompanied by a Chain-of-Custody record.

- Clearly labeled immediately upon collection. Each sample bottle should include the following information:

  - The project name and number.
  - A unique sample designation.
  - The date and time sample was collected.
  - Designation of the sample as a composite, if appropriate.
  - Identification of preservations used.
  - Any remarks, as needed.
  - Sampler's name or initials

After samples are collected, identified and preserved in the field, they are maintained under Chain-of-Custody procedures as described in Quality Assurance Project Plan provided in Appendix B.

When preparing a cooler for shipment, the samples should be inventoried and logged on the Chain-of-Custody form. As each sample container is logged on the Chain-of-Custody form, it should be wrapped with protective material (e.g., bubble wrap matting or plastic gridding) to prevent breakage. Each sample bottle should be packaged in an upright condition. All sample bottle caps should be checked during this time and tightened if needed. Additional packaging material, such as bubble wrap or Styrofoam pellets, should be spread throughout the voids between the sample bottles.

Most samples require refrigeration as a minimum preservative. Cold packs or ice placed in heavy-duty ziplock-type bags should be distributed over the top of the samples. Additional packaging material should then be placed to fill the balance of the cooler or shipping container. A brief description of sample packaging and shipping protocol is as follows:

- Place the completed Chain-of-Custody records in a ziplock-type plastic bag and place the bag on top of the contents within the cooler or shipping container. Retain a copy of the Chain-of-Custody record with the filed records.

- Close the top or lid of the cooler or shipping container and with another person rotate/shake the shipping container to verify that the contents are packed so that they do not move. Add additional packaging material if needed and reclose.

- Place Chain-of-Custody tape (signed and dated) at two different locations (front and back) on the cooler or shipping container lid and overlap with transparent packaging tape. Packaging tape should encircle each end of the cooler or shipping container at the hinges.

- Sample shipment should occur via a carrier that can guarantee 24-hour delivery. Retain copies of all shipment records as provided by the shipper.

- The documentation for support of proper packaging and shipment will include Chain-of-Custody records and shipper's records. All documentation will be retained in the project files.

5.5 DOCUMENTATION PROCEDURES

Color photographs and/or videos will be taken of representative sampling locations and the surrounding site to show the area, sampling equipment and related site activities. Image file name will be logged on the appropriate field documentation form to identify photographs with the correct sampling location. Specific requirements for the documentation are provided in the QAPP (Appendix B).

5.6 SAMPLE DESIGNATION

Field sampling personnel are responsible for describing, documenting, labeling, packaging, storing, handling and shipping samples obtained in the field so that all samples can be readily identified. These practices are necessary to ensure the integrity of the sample from collection to data reporting.

To ensure correct identification of the samples collected, a unique alphanumeric code will be assigned to each sample, as follows:

- Letter codes will identify the sample type. Examples include:

  SE - Sediment sample
  S - Soil sample
  SG - Soil Gas
  SS - Surface soil sample
  MW - Monitoring well sample
  SW - Surface water sample
  RS - Radiological sample

The sample code shall be followed by a unique location number, as appropriate.

5.7 DAILY FIELD REPORTS

A daily field activity log shall be used as a record of daily field activities showing the sequence of events. At a minimum, the log will include the following information:

- Project name and number.
- Date.
- Starting/ending time and nature of each field activity.
- Names of all contractor personnel on the site, including visitors.
- Weather conditions.
- References to appropriate field logs for details of each activity performed (e.g., reference sample collection log for details of all samples collected that day).
- Identification of any photographs taken.
- A list of rented, leased, or subcontracted equipment.

5.8 SAMPLE LABELS

Sample labels and identity are of critical importance in the collection of samples. All information provided for a sample is keyed to its unique sample designation. This designation, shown on all sample containers and associated field data forms, is utilized for data recall from the database system.

Field personnel will attach a label to each sample container either before or immediately after filling each container. It is the responsibility of the field sampling team leader to maintain a supply of sample labels at the site. The sample label must contain all of the following:

- The project name and number.
- A unique sample designation.
- The date and time sample was collected.
- Designation of the sample as a composite, if appropriate.
- Identification of preservatives used.
- Any remarks, as needed.
- Sampler’s name or initials.

The sample labels will be placed on the sample containers so as not to obscure any QA/QC data on the containers such as bottle-lot code numbers. Sample information must be printed in a legible manner using indelible ink. The label must contain sufficient information so that the sample can be identified on the sample information form or collection log.

All QC samples, including co-located or duplicate samples and sample blanks, shall be identified using the same information as that used for regular sample identification, but in a manner that does not readily identify them as QC samples. This information will be recorded in the sample collection log.

5.9 QUALITY ASSURANCE/QUALITY CONTROL SAMPLE TYPE AND NUMBER

Field QC check samples may include field rinsate, filed blank, trip blank, and duplicate (co-located) samples. These will be identified in the same manner as described above.
The frequency and type of quality control samples to be collected are specified in Table 10.

5.10 SAMPLE COLLECTION LOG

A sample collection log will be used as a record of filed sampling activities and at a minimum, will include the following:

- Project name and number.
- A unique sample identification.
- The date and time sample was collected.
- Designation of sample as a composite, if needed.
- Identification of preservatives used.
- Any remarks, as needed.
- Sampler's name or initials.

5.11 VARIANCE LOG

Significant variances from the sampling plan, QAPP and the HSP shall be documented on a variance log. Variances affecting project scope and/or schedule must be approved by the Project Coordinator. Any variance from the HSP must be approved by the Site Safety Officer (SSO). Copies of the variance log will be permanently maintained in the project file.

5.12 DOCUMENT MAINTENANCE

Field personnel are responsible for recording filed activities on the appropriate field documentation form in sufficient detail to allow the event to be reconstructed without relying on memory. It is the responsibility of the field personnel to ensure that all documents are complete and legible. At the end of each day, all documents completed shall be reviewed by the Design Contractor for accuracy, completeness and legibility.

The field documentation forms or records that shall be used during this investigation are listed below:

- Sampling Information Form
- Sample Collection Log

- Sample Chain-of-Custody Record
- Daily Field Report
- Weekly Field Report
- Variance Log Form

Each completed form (a copy, or original, depending on the type of form) will be maintained onsite in chronological order with other completed forms of the same type until the completion of the field activity. Copies of specific forms will be sent to the project office on a weekly basis for management purposes unless waived by the Project Manager. Upon completion of the filed investigation, all original field records and copies will be transferred to the Project Manager. File and working copies will be retained by the project office personnel for data evaluation and report preparation, as necessary.

5.13 LABORATORY RESULTS

The requested deliverables for Level III QA include the following:

- Case Narrative
- Sample Analysis Report
- Sample Cross Reference (if required)
- Chain-of-Custody Record
- Analysis Report:
  - Preparation and analysis run logs
  - Raw data and chromatograms
- Quality Control Summary:
  - Minimum detection limit summary
  - Initial calibration data
  - Detailed QA/QC data
  - Corrective Action reports

The laboratory selected for the analysis of the samples is Associated Laboratories in Orange, California. Associated is a State Certified Laboratory. A copy of the Laboratory QAQC Plan is included in Appendix D. Table 9 provides a list of the various detailed QA/QC data required for each of the specific analyses.

5.14 DECONTAMINATION PROCEDURES

Precleaned stainless steel or brass sample sleeves will be used for the soil samples obtained from hand augers and hollow-stem augers. The sleeves will be precleaned by immersing and scrubbing in a non-phosphate cleaner/water solution, followed by a tap water rinse and a distilled water rinse. The non-phosphate cleaner will be Simple Green or equivalent. A copy of the decontamination procedures is included in Appendix C.

Augers (including hand augers and hydraulically-pushed sampler units) will be decontaminated prior to and between drilling at each borehole site by steam cleaning or high-pressure hot water cleaning. Split-spoon samplers will be disassembled during decontamination. The components will be decontaminated by immersion in a non-phonsphate cleaning solution (Simple Green or equivalent), scrubbed by brushing, and followed by rinsing with tap water and then by rinsing with distilled water.

Non-disposable sampling equipment (e.g., stainless steel bailer) will be decontaminated at the location where it was used.

The following is the general decontamination procedure for field equipment used in the subsurface investigation:

- Removal of soil and placement in drum.
- Washing and scrubbing with non-phosphate detergent.
- Tap water rinse.
- Deionized/distilled water rinse.
- Isopropyl alcohol rinse.
- Deionized/ distilled water rinse.
- Organic-free water rinse.
- Air dry.
- Wrapping in aluminum foil, shiny side out, for transport.

5.15 WASTE HANDLING

All waste materials generated during this investigation will be collected, drummed and disposed of in an appropriate manner.

5.16 HEALTH AND SAFETY PLAN

All activities at the site will be conducted in accordance with the Site Health and Safety Plan. A copy of the Health and Safety Plan is provided in Appendix E.

6.0 REFERENCES

- Boeing – Rocketdyne Santa Susana Field Laboratory; 4th Quarter 2004 NPDES Discharge Monitoring Report, submitted to Regional Water Quality Control Board February 15, 2005 (link from Boeing Website)
- Boeing – Rocketdyne Santa Susana Field Laboratory; Happy Valley Interim Measures Work Plan Addendum and Amendment, August 2003 (Draft – Under review by DTSC) from website.

- Boeing – Rocketdyne Santa Susana Field Laboratory; Happy Valley Interim Measures Work Plan Addendum and Amendment and DTSC Documentation, August 2003 from website.

- DTSC – 1994. Preliminary Endangerment Assesment Guidance Manual.

- CRWQCB – Advisory Active Soil Gas Investigations 2003.

- U.S. Environmental Protection Agency (USEPA). – 1983. Interim guidelines and specifications for preparing quality assurance project plans. QAMS-005/80.

- U.S. Environmental Protection Agency (USEPA). – 1986. Test methods for evaluating solid waste, SW-846, 3rd Ed. Office of Solid Waste and Emergency Response. November.

- U.S. Environmental Protection Agency (USEPA). – 1987. RCRA facility investigation (RFI) guidance. OSWER Directive 9502.00-6C, July 1.

- U.S. Environmental Protection Agency (USEPA). – 1989. Guidance for preparing quality assurance project plans for superfund remedial projects.

- U.S. Environmental Protection Agency (USEPA). – 1992. Guidance for data usability in risk assessment (Part A). Publication 9285.7-09A, PB92-963356. April. P.59.

- U.S. Environmental Protection Agency (USEPA). – 1993. Methods for chemical analysis of water and wastes, EPA-600/4-79-020. March.

- U.S. Environmental Protection Agency (USEPA). – 1994a. Laboratory data validation, functional guidelines for evaluating organics analyses. February.

- U.S. Environmental Protection Agency (USEPA). – 1994b. Laboratory data validation, functional guidelines for evaluating organics analyses. February.

- U.S. Environmental Protection Agency (USEPA). – 1996. Test methods for evaluating solid waste, SW-846, 3rd Edition, Update III. December.

- U.S. Environmental Protection Agency (USEPA). – 1999. Requirements for Quality Assurance Project Plans for Environmental Data Operations, EPA QA/R-5, November.

7.0 STATEMENT OF LIMITATIONS

Information provided in this report by Allwest Remediation, Inc., Project Number 05-8520 EI 01 is intended exclusively for the use of Centex in the assessment of potential environmental liability for the subject property. The findings and conclusions discussed in this report are based on field and laboratory data collected during the course of this investigation and our current understanding and interpretation of environmental regulatory agency regulations, guidelines and policies. The professional services have been performed in accordance with practices generally accepted by other construction engineers, geologists, hydrogeologists, environmental engineers, and environmental scientists practicing in this field. No other warranty, either expressed or implied, is made. There is no guarantee that the work conducted will identify any and all sources or locations of contamination.

Respectfully submitted,

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